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all the components of motion; which must give us the true intensity in just the sense that this term is employed by Mr. Hayden and myself. Its graphic representation will be the curves we have given and no other.

Professor Le Conte remarks: "We have assumed all along that the intensity or excursion of the earth-particle, or the height or amplitude of the wave, varies inversely as the square of the radius of the agitated sphere. The authors as well as other writers assume this law." Here he evidently misapprehends. It is indeed assumed that the intensity varies inversely as the square of the distance, but the amplitude varies (subject to later qualification) in a simple (not duplicate) inverse ratio with the distance. The intensity for a given wave-length is proportional to the square of the amplitude; for, by Hooke's law (*ut tensio sic vis*), the time of vibration of a particle in an elastic wave of given wave-length is uniform whatever the amplitude. Hence the mean velocity of the particle is simply proportional to the length of its path, i.e., to the amplitude. But its energy is proportional to the square of its velocity, ergo, to the square of its amplitude. Hence, too, the amplitude must be inversely proportional to the radius of the spherical wave, provided no energy is dissipated in transmission. If, then, the amplitude at Charleston were four inches, at a distance of a thousand miles it would, without dissipation, amount to about two millimetres, — a well-marked tremor.

Professor Le Conte's suggestion that the law of variation of intensity with distance may be affected by reflection back into the earth from the surface is, so far as I am aware, a novel one. That there must be some energy so reflected seems undisputable. But the portion so reflected would constitute a new wave, or series of new waves, independent of those already in progress. It would thus add to the number of waves without affecting the energy of those already in progress, except at points of coincidence or interference.

Seebach's method of finding the depth was objected to, because it requires a degree of accuracy much beyond the highest we can hope to attain. The speed of an earthquake-wave is enormous (the time-observations obtained for the Sonora earthquake give a very high wave-speed; they are not as yet fully examined and discussed, but the preliminary examination indicates a speed about the same as that obtained in the Charleston earthquake), the space-intervals at which the time-records must be made must be short, and the time-intervals correspondingly so. The data really needed are differences in these time-intervals; and these differences would most certainly be much smaller than the probable errors of observation.

C. E. DUTTON.

Washington, July 9.

The Freezing-Point of Sea-Water, and the Melting-Point of Sea-Water Ice.

THE difference existing between the result from my determination of the freezing-point of sea-water (*Science*, ix. No. 228), and the accepted one as value for the same of 28°.8 F., seems to be inexplicable, unless we can assume that in the methods followed for its determination a wrong interpretation has been put on one of the results.

There can be no doubt, that, if the temperature of a body of sea-water is lowered till conglaciation takes places under slight agitation of the water, the temperature then existing at its surface will be that of its freezing-point.

On the other hand, it seems probable, that, when the determination of the freezing-point is made by means of an admixture of sea-water and its ice in thermic equilibrium, we have reached a condition that would be better described as the melting-point of sea-water ice.

Could we assume that in the change from the liquid to the solid form, in freezing, all the saline particles were taken up without chemical changes, it would be reasonable to suppose that the melting and freezing points would coincide; but if, on the other hand, we assume that in this conversion the entire saline particles have been expelled from the solid, we must conclude that part of the heat was expended in expelling these particles, for we may not imagine *any* work performed without a corresponding absorption of energy. We will have, in this imaginary case, essentially fresh-water ice; and, if we were determining the freezing-point of sea-water with ice so constituted, thermic equilibrium would be obtained at a temperature of 32°, which we should erroneously call the freezing-point of sea-water.

Granting the accuracy of these two suppositions, it seems certain that in the case when freezing takes place to the exclusion of four-fifths of the saline particles, as is the case with sea-water, thermic equilibrium will exist between sea-water and its ice at a temperature intermediate between its freezing-point (26°.7 F.) and that of melting ice (32°.0 F.), and experiment has proved this temperature to be 28°.8 F.

I would therefore predict, that, in the case where a liquid is converted into a solid by freezing, the temperature of the freezing-point of the liquid will be equal to that of the melting-point of the ice, only in the case or cases where each contains the constituents of the other in the same proportion.

W. A. ASHE.

The Quebec Observatory, July 4.

Concerning Filth-Diseases.

THROUGH the heart of the city of Baltimore, flowing southward, runs the bed of the sluggish stream Jones Falls. Eight miles northward, its waters are divided and turned into the city water-supply. Within the city, the stream is confined by handsome stone walls, which form a canal of dimensions twenty feet deep by a hundred feet wide and two and a half miles long — roughly. The canal empties into the Back Basin, a nearly stagnant pool two hundred yards wide by five hundred yards long, — which itself is connected by a short canal with the City Basin and tide water of slight activity.

In the northern suburbs, and within the city, the Falls and Back Basin receive the drainage from a territory in which dwell eighty thousand souls, roughly estimated, a considerably portion of whom is packed into a lower quarter of the city. They receive that from the Causeway and a part of Fell's Point, — quarters fairly designated slums.

The sediments in this drainage are precipitated in the lower half-mile of the Falls and in the Back Basin. Here they undergo fermentation and decay, at times giving off odors offensive indeed. It is a necessity of the situation that these sediments must be removed by dredging; and with the active officials of the dredging companies, and with their workmen, the writer has been in quite constant communication for nearly three years. These people pass their days stirring about and digging up this fermenting and decaying city garbage and mud and sewage. They live in an atmosphere loaded with offensive gases. And what of their health? With singular unanimity they declare that the occupation is a healthy one. Excepting in rare instances a case of nausea and vomiting, which quickly pass away, they have no more sickness than those in other occupations. As a matter of fact, the writer has not in nearly three years heard of any case of zymotic disease among about a hundred men engaged in this dredging.

The decaying refuse from the slums of a city, deposited in warm and nearly stagnant waters, ought to contain all manner of poisonous elements, — animal, vegetable, gaseous, or otherwise. Men stirring up and removing such material ought to sicken and die. Curiously enough, they do not — more than men in other occupations.

The writer has no knowledge as to what filth-diseases are, or are not, and has no suggestions to offer. The studies here indicated were made because the field seemed to promise a rich harvest of such diseases, but the promise has not been fulfilled so far.

WM. GLENN.

Baltimore, July 11.

Queries.

8. WHOOPING-COUGH IN THE CAT. — A Liverpool cat is reported to have contracted whooping-cough from a boy sick with that disease. For two weeks it had five or six attacks daily of the cough characteristic of that affection. Is this unusual? X.

9. BANANA, COCOANUT, AND INDIA-RUBBER. — Can any one send us lists of books on the cultivation of the banana, cocoanut, and india-rubber? J. C. E.